The sun's parallax, derived from the combination of the results obtained at Greenwich with those of our Observatory, was 8″·93, while from the combination of those at the Cape with the Pulkowa observations gave 8″·96.

It is a matter of the highest scientific interest that the results arrived at by the co-operation of these four observatories should correspond so nearly with each other, so exactly with those deduced theoretically by Mons. Le Verrier, and so nearly approaches that arrived at by another distinct method by Faucoult, viz., from his experiments on the velocity of light.

The distance of the sun arrived at from the Williamstown and Greenwich observations is, according to Mr. Stones', (of Greenwich,) calculation, 91,512,649 miles, or over 3,000,000 of miles less than has hitherto been assumed.

In conclusion, I may remark that satisfactory in the highest degree as these results appear to be, astronomers are looking forward to the transit of Venus, in 1874, to ratify them or to determine with greater exactitude than the Mars method is susceptible of, the more precise amount by which our hitherto accepted distances of the sun requires to be diminished.

This transit of Venus will take place soon after mid-day, on December 9th, 1874. Melbourne is admirably situated for observing it. European astronomers are already taking steps to secure proper co-operation in the Southern Hemisphere, and I trust that our Observatory, so liberally furnished with some of the finest instruments in the world, will do as well for science, and for the credit of Victoria, as it was permitted to do in the determination of the Sun's distance, in 1862.

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## Art. XXXII.—*Notes on the Geology of Hobart Town.*

By Thomas Harrison.

[Abstract. Read 8th August, 1864.]

Tasmania is, as it were, connected with Victoria by two chains of islands, running in a northerly direction, respectively, from Cape Portland and Cape Grimm to Wilson's Promontory and Cape Otway. The lines of these two chains are afterwards continued in the several mountain systems of Tasmania and Australia.

The age of the several parts of the Tasmanian mountain system is supposed to vary considerably, and evidence would go to show that Tasmania, of a past geological epoch, had a very different form from that which characterises it at the present time.

At first, it most probably appeared as a group of islands: about five in number. In the succeeding epoch much of the intervening portion of sea bottom was elevated, and the area existed as one continuous mass of land; indented, however, by at least two deep bays. The first of these extended from Campbell's Town to the sea; the second, and larger, occupied the valley of the Derwent, and much of the surrounding district.

These bays were, in time, filled by what appears to be the carboniferous rocks of Tasmania, thus becoming the future coal basins of the island. It is to the geological features of the last-named basin that the following notes bear reference.

What may be termed the method of survey adopted, was to traverse the country by a series of lines radiating from Hobart Town as a centre.

The first of these lines was along the main road, in the direction of New Norfolk, a town situate on the Derwent, about twenty miles from the metropolis.

Leaving the coal seams of New Town on the left, there were met with a succession of carboniferous sandstones and shales; cut by numerous dykes and masses of eruptive green stone and black basalt; or covered over by gravel and other aqueous deposits until near Bridgewater (ten miles from Hobart Town), where is exposed a dense clay stone, afterwards in turn succeeded by thick beds of highly fossiliferous limestone. The latter, after extending several miles, and presenting a gradually rising series, apparently dip in quite a contrary direction; so that, after passing by masses of river deposits and dykes of basalt, at New Norfolk, the clay stone of Bridgewater is again met with, and then, towards Hamilton, are beds of sandstone, shale, and coal, appearing in the reverse order of the succession passed over in journeying from Hobart Town to Bridgewater. It would seem, therefore, that an anticlinal exists near the latter place.

A second line of route passed over Grass Tree Hill, towards Richmond, displaying a somewhat similar series, only that the limestone nowhere appears at the surface.

A third route lies in the direction of Clarence, and towards Frederick Henry Bay; the geological features resembling those of the last-mentioned district. On a line, in the direction of Sandy Point Bay, also, the rocks differed but little from those of the two preceding, only that numerous erratic blocks of limestone were scattered about the roadside, showing that the formation was probably at the surface at no great distance.

In a series of branching tracks leading up the gullies of Mount Wellington, probably in consequence of convulsive movements, the limestone is met with, within a mile of the boundary of Hobart Town.

Hobart Town itself is situate on undulating ground, rising gradually from the sea towards the north-west. Two valleys traverse the area in a longitudinal direction. On the western side, a hill named Knocklofty forms a considerable elevation; and still further in the same direction, Mount Wellington rises to a height of more than 4,000 feet.

On a map geologically coloured it will be seen, that the site of Hobart Town is composed of a number of broad and alternate stripes of sandstone and basalt, such stripes running parallel with the valleys previously alluded to.

It is worthy of remark, that the whole of the sandstones have a dip in the direction of Mount Wellington. This peculiarity is, save on the sides of the mountain itself, pretty general over the whole adjacent district. On the sides of Mount Wellington the dip is in a directly opposite direction.

In a section drawn from the Derwent to the top of Mount Wellington, the arrangement of the sandstones resembles a series of ratchet teeth, rising one above the other towards the south-west. As a very homely illustration, we may suppose a set of wooden cubes to be laid out upon a yielding foundation, say a sofa cushion, so that the surface of the whole represents a perfectly level superficies. Anon, and some disturbing force changes the horizontal plane of each cube into a gently sloping incline, and forms at every joint a diminutive escarpment. If we can only imagine that some molten substance, such as wax, has been forced through the various interstices from beneath, so that its overflow partially fills up the miniature valleys, we shall have a model representation of Hobart Town with its sandstones, dislocations, and eruptive rocks.

It will probably be asked why the dip of the various

beds remains so constantly the same, and towards instead of from an evidently upheaved rock? Perhaps the local dip, in the opposite direction on the sides of Mount Wellington, may explain the difficulty. If a vast level plateau, such as must have once existed hereabouts, should ever be broken up by the protrusion of a mountain chain like the Mount Wellington range, it is not unreasonable to suppose that many fractures would take place at a distance from, and parallel to, the eruptive mass. In addition to this simple fracture of the beds, a lateral pressure may also have led to a phenomenon somewhat analogous to what takes place when the pieces of ice, in a large floe, commence to pack one upon the other.

The secondary fissures do not appear to have been filled up with basalt contemporaneously with their formation. The molten matter seems to have been run into them as previously existing crevices. Still the filling up may have followed closely, almost instantaneously, upon the shock causing the fracture.

Of the rocks of the district, the lowest is of an extremely fossiliferous character, and is called mountain limestone by the colonists. It is divided into two beds. Of these, the lower is very calcareous, and contains a profusion of bivalves (*spirifera* and *producta*): the upper is more arenacious, and is literally crowded with coral (*fenestrella* and *stenopora.*)

It would seem as if the calcareous matter had granulated from the upper to the lower beds. In the former, the removal of the shells by infiltration, gives rise to a singularly honeycombed appearance, wherever the rock is exposed in a cliff. In the lower rock the matter of the original shells is substituted by crystallised carbonate of lime.

Above this formation is a dense compact stratum, locally known as mud or clay stone. Mr. Selwyn estimates its thickness at fully 400 feet. There are a few impressions of shells found in it occasionally, but, generally, fossils are of rare occurrence.

Throughout the mass, at intervals, are a number of pieces of angular quartz. The unworn condition of these would suggest some method of transport other than mere power of the water. Probably they were floated from a distance, entangled in the roots of sea-weed.

It was probably the prevalence of the turbid water giving rise to this stratum which destroyed the corals, so numerous in the upper beds of limestone immediately below.

Above the claystone is a great thickness of sandstone. This stratum is singularly bare of organisms. But as sandstones generally contain but few fossils, the barrenness, in this instance, is no proof that the seas were untenanted with life.

Interstratified with the upper portion of the sandstone beds, are layers of shale, bearing impressions of fern leaves and calamites, together with one or two thin layers of coal, changed for the most part into anthracite.

The absence of *Sigilaria, Stigmaria, Lepedodendra,* and other plants characteristic of the English coal measures, would seem to suggest that the coal of Tasmania, like that of Victoria, is not of the true carboniferous period.

What may, in some measure, go to confirm the opinion so hazarded, is the discovery in the sandstone of a bone, said by Professor Owen to be that of a *Labyrinthodon,* a batrachian generally associated with rocks of the Triassic age.

A Hobart Town geologist (Mr. Morton Allport), who first directed my attention to this interesting fossil, supposes the rock from which it was taken to be situate above the coal beds of the district.

It is with extreme diffidence that I venture to express an opinion, but I had thought, and still think, from an examination of the locality, that the bed, in which the fossil was discovered, lies far below the carbonaceous strata, and that the carbonaceous strata in that particular spot have been swept away by denudation. This would render the fossil of great use in determining the geological position of the Tasmanian coal beds, and show that they were deposited contemporaneously with the reptilian forms characteristic of the secondary period.

It may be asked, as the limestone is of Palæozoic and the coal of Mesozoic age, whether the surface remained unsubmerged during the intervening period, or whether there has been a subsequent removal of rocks once deposited?

Perhaps it may appear that neither of these alternatives is absolutely required. The Permian group may, after all, be represented by a portion of the strata intervening between the limestone and the coal, although, through the absence of fossils, no evidence of the fact is anywhere apparent. The magnesian limestone characteristic of the Permian age may have been so far local as to be excluded altogether from Tasmanian waters. Probably the beds, during the course of formation, resembled, not a little, the accumulations of sand

now gathering upon the coasts both of Australia and Tasmania; deposits which, in a future age, will probably be entirely barren of fossils. Such beds would necessarily present but few evidences of changes going on elsewhere, or even of those taking place closely adjacent. If I may borrow a simile, they will bear the same relation to fossiliferous strata which the chronicles of a barbarous and uncivilised nation will bear, to one wherein the arts of painting, sculpture, and poetry are cultivated, and wherein a knowledge of letters enabled the historian to chronicle and perpetuate the events taking place around him.

In speaking of the section passed over between Hobart Town and New Norfolk, mention has been made of certain "aqueous deposits." Among these, the most remarkable feature is the enormous amount of pebbles accumulated in many places. Such pebbles are of every size, from that of coarse grains of sand to boulders measuring several feet in circumference. They are composed of a great variety of materials: quartz-rock, granite, sandstone, limestone, basalt, and diorite, and, in a few instances, what I judged to be fragments of silurian slates. They are always waterworn to a great extent. In some places, an accumulation of these alone occupies the whole height of an exposed section, but in most cases the pebbles are interstratified with a deposit not unlike the Pleiocene drift of Victoria.

One or two local geologists suggested that the phenomenon might be due to glaciers once existing thereabouts. The more likely cause would seem to be one involving tidal action. The Derwent, as may be seen from the map, is of very unequal widths in different portions of its course. Now it contracts into a narrow channel, and anon it expands into a wide lake-like basin. As may be supposed, this conformation, by the expansions acting as reservoirs, receiving, and giving out, the tidal wave, is productive of currents running with a rapidity quite sufficient to hurl onwards masses of stone large as those in question.

As the land rose from out the sea, it is probable that these features were alternately enlarged or diminished, so that the succession in the same spot of beds, apparently deposited by slow and rapid currents, is amply accounted for.

Some beds of shells, greatly resembling the estuary deposits around Port Phillip Bay, have lately excited considerable attention in Hobart Town: one party referring them to the refuse left by the aborigines during their visits to the

sea-shore ; the other, seeing in the same beds evidence of a recent and sudden upheaval of the land. Truth, probably, lies between these two extremes. The refuse of native feasts may certainly have been the origin of some few isolated patches, but many of the beds are by far too extensive not to have been formed in a natural manner during a submergence of the land. There is, however, so far as these observations extended, no evidence to show that any part of the island has risen with a sudden motion. Any upheaval which has taken place was most probably of a gradual kind, somewhat akin to that which is now supposed to be imperceptibly elevating the entire coast line of the Australian continent.

At Geilstov Bay, nearly opposite to Hobart Town, are situated some extensive beds of fresh-water limestone or travertine. Many of the shells therein, and some of the plants, are identical with some now living ; but there are others, of which no recent analogues are to be met with in any part of the island.

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ART. XXXIII.—*On the Systematic Position of the Nardoo Plant, and the Physiological Characteristics of its Fruit.* By FERD. MUELLER, M.D., F.R.S.

[Read 29th September, 1862.]

The observations which I beg to offer to the Royal Society of Victoria on this occasion, have only but in a limited measure claims on originality, inasmuch as they are mainly founded on an essay by Dr. T. Hanstein, read before the Academy of Sciences of Berlin, in the beginning of this year. The essay referred to was transmitted by Sir Redmond Barry, who received it during his stay in Berlin from Professor Ehrenberg, and who expressed a desire that it should be translated and republished in Victoria. Dr. Hanstein reviews in this memoir the various described species of Marsilea, indigenous to Australia, and enters then at some length into a physiological treatise, explaining with great ability the organisation and the development of the Marsilea fruit. Of the physiological part of this essay, as highly important, I thought it desirable to submit a translation, abridged only in a few trifling points. In reference to the systematic part of the essay, I consider it however necessary to state briefly the